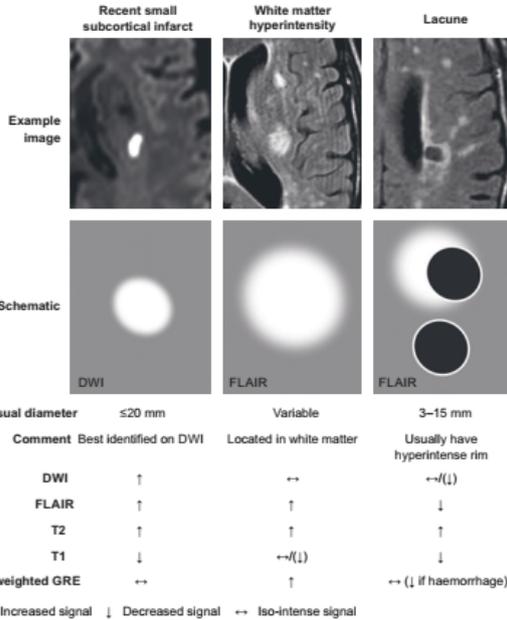


Master Thesis

„Deep Learning for the Detection of MR Imaging Biomarkers of Cerebral Small Vessel Disease“



Excerpt from a compilation in [2]: Examples of MRI findings for lesions related to small vessel disease (upper), schematic representations (middle) of MRI features for changes related to small vessel disease and an overview of imaging characteristics (lower) for individual lesions.

Background. Neurodegenerative diseases such as Alzheimer’s Disease commonly coexist with cerebrovascular diseases in older people. Cerebral small vessel disease (SVD) is the most common vascular cause of dementia, a major contributor to mixed dementia, and the cause of about a fifth of all strokes worldwide. Imaging biomarkers of SVD in conventional MR scans include recent small subcortical infarcts, white matter hyperintensities, lacunes, prominent perivascular spaces, cerebral microbleeds, and atrophy [1]. Examples for typical findings are depicted in the figure on the left. In order to analyze the occurrence of these typical markers in the MR images of large patient cohorts, algorithms to automate their detection, segmentation and quantification are needed.

[1] Pantoni, Cerebral small vessel disease: from pathogenesis and clinical characteristics to therapeutic challenges, *The Lancet Neurology*, 2010, 9, 689-701

[2] Wardlaw et al., Neuroimaging Standards for Research into Small Vessel Disease and its Contribution to Ageing and Neurodegeneration, *The Lancet Neurology*, 2013, 12, 822-838

Tasks. In this thesis, automated algorithms for the segmentation/detection of one of the SVD imaging biomarkers shall be developed, implemented and evaluated for the application to a large, local and very heterogeneous MRI database of SVD patients. The effort will be part of the collaboration between the “MedDigit” (Medicine and Digitalization) group and the “Mixed cerebral pathologies and cognitive aging” research group, a multidisciplinary team with profound expertise in both the technical as well as the medical aspects of this thesis. The groups are based at the Department of Neurology, University Hospital, Magdeburg and the German Center for Neurodegenerative Diseases (DZNE), Magdeburg.

We offer:

- participation in cutting-edge, clinically relevant research
- cooperation with clinical partners, joint publication of results
- assistance and approachable supervision with thesis implementation und writing
- pleasant and supportive atmosphere

We expect:

- good programming knowledge (Python, PyTorch/Keras/Tensorflow)
- previous knowledge (Deep Learning, (Medical) Image Processing)
- good study achievements (CV, Computer Science, Math, ...)
- Ability to work in a team

Additional information:



Please send your relevant and persuasive application together with an actual transcript of grades per e-mail to:

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